Local Potential Changes

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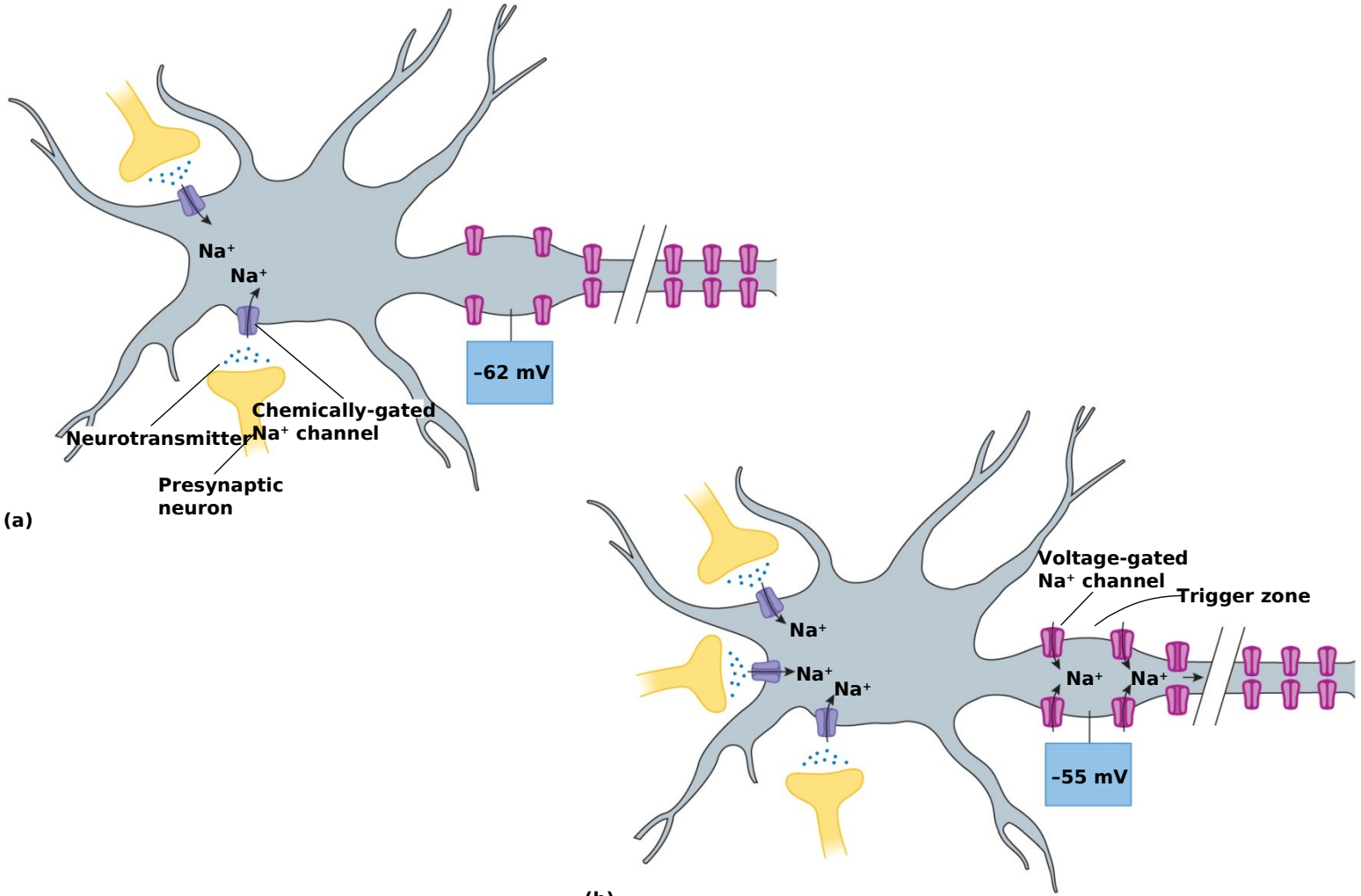
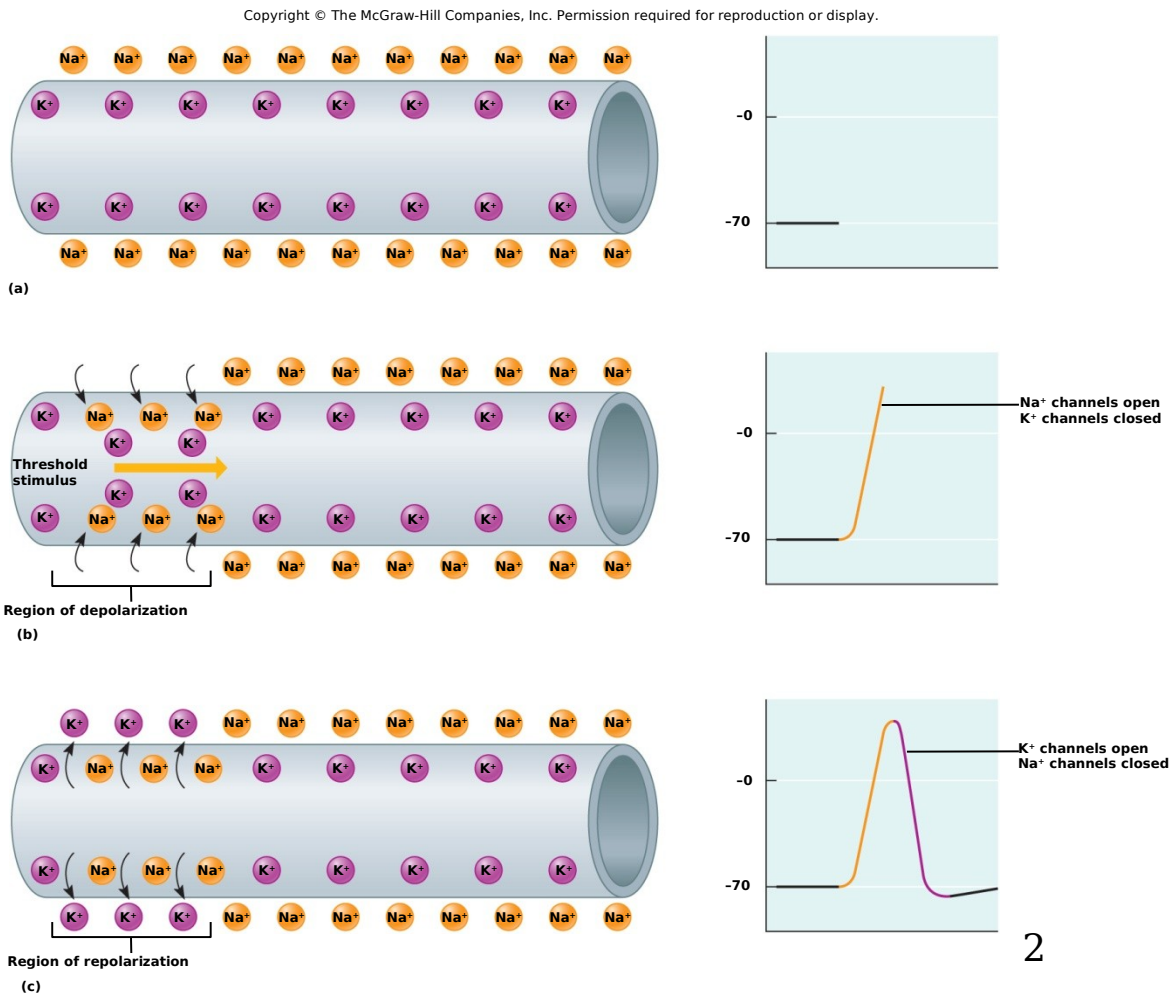


Action Potentials

- At rest, the membrane is polarized (RMP = -70)
- Threshold stimulus reached (-55)
- Sodium channels open and membrane depolarizes (toward 0)
- Potassium leaves cytoplasm and membrane repolarizes (+30)
- Brief period of hyperpolarization (-90)



Action Potentials

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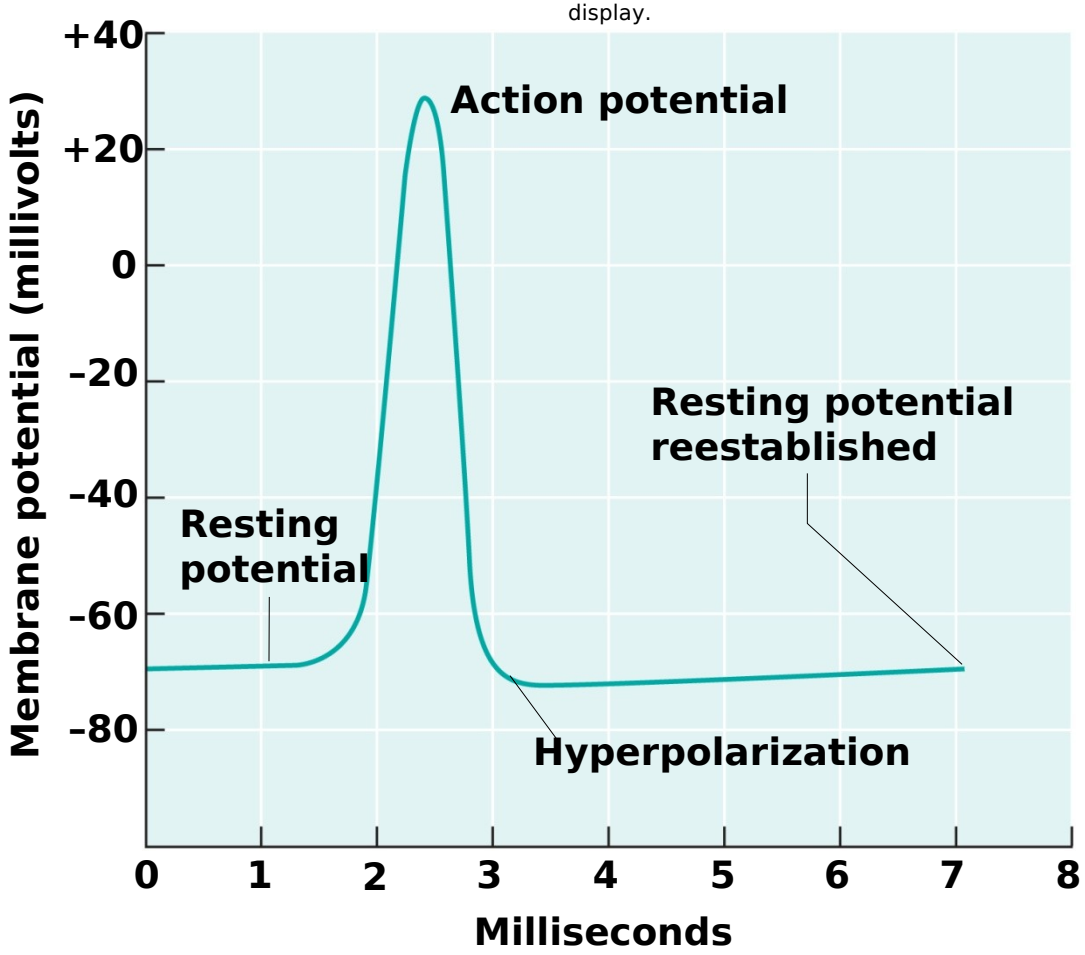

Action Potentials

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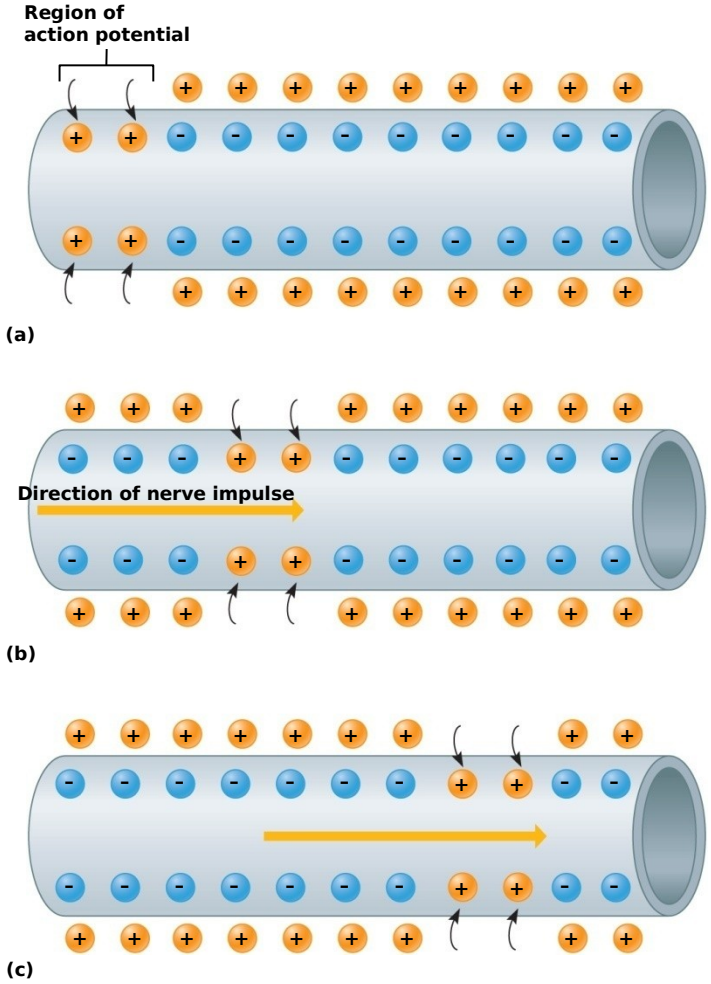

Animation: Action Potential Propagation in Myelinated Neurons

Step
Loop

Animation: Action Potential Propagation in Unmyelinated Neurons

Begin

Step
Loop

All-or-None Response

- If a neuron responds at all, it responds completely

- A nerve impulse is conducted whenever a stimulus of threshold intensity or above is applied to an axon

- All impulses carried on an axon are the same strength

Refractory Period

- Absolute Refractory Period
  - Time when threshold stimulus does not start another action potential
- Relative Refractory Period
  - Time when stronger threshold stimulus can start another action potential

Impulse Conduction

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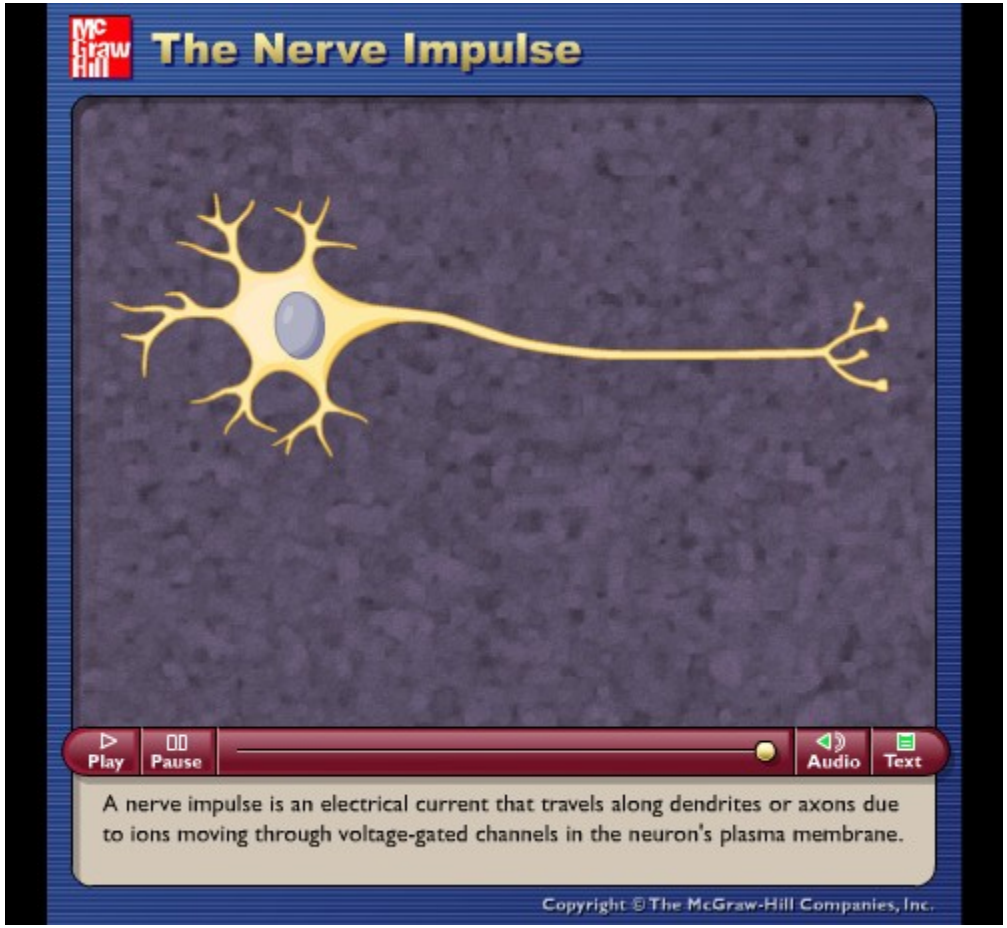
TABLE 10.3 | Events Leading to Nerve Impulse Conduction

1. Nerve cell membrane maintains resting potential by diffusion of Na^+ and K^+ down their concentration gradients as the cell pumps them up the gradients.
2. Neurons receive stimulation, causing local potentials, which may sum to reach threshold.
3. Sodium channels in the trigger zone of the axon open.
4. Sodium ions diffuse inward, depolarizing the membrane.
5. Potassium channels in the membrane open.
6. Potassium ions diffuse outward, repolarizing the membrane.
7. The resulting action potential causes an electric current that stimulates adjacent portions of the membrane.
8. Action potentials occur sequentially along the length of the axon as a nerve impulse.

Animation: The Nerve Impulse


The Nerve Impulse
Play
Pause
Audio
Text
A nerve impulse is an electrical current that travels along dendrites or axons due to ions moving through voltage-gated channels in the neuron's plasma membrane.
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10.7: Synaptic Transmission

- This is where released neurotransmitters cross the synaptic cleft and react with specific molecules called receptors in the postsynaptic neuron membrane.
- Effects of neurotransmitters vary.
- Some neurotransmitters may open ion channels and others may close ion channels.

Synaptic Potentials

- EPSP
  - Excitatory postsynaptic potential
  - Graded
  - Depolarizes membrane of postsynaptic neuron
  - Action potential of postsynaptic neuron becomes more likely

SP

Inhibitory postsynaptic potential

Graded

Hyperpolarizes membrane of postsynaptic neuron

Action potential of postsynaptic neuron becomes less likel